



Photo: G. H. Minshall.

EAST AFRICAN TROUT.
Length 24 in. Weight 6½ lbs.

[See page 83.]

FISH CULTURE IN BRITISH EAST AFRICA

By D. E. HUTCHINS

TROUT ON THE ABERDARE MOUNTAINS

A notable development has recently taken place in British East African fish culture. It will be recalled that in 1905 trout were introduced to the Aberdare mountain streams by Mr. Hinde (Provincial Commissioner), and by Mr. Grogan and an association of various persons interested in the experiment. These fish were placed in a small stream, the Gùra, on the cold high-lying moorland, crossed by the road from Naivàsha to Nyeri. The trout introduced were of three kinds: Loch Leven, German brown trout, and Californian Rainbow trout. The last consignment, including the German trout, was an unfortunate one; most of the fry were lost before they were turned out, but it is said that a few of the German trout escaped into the river before the loss of the main lot: so that the trout now in the Gùra stream may be descended from all three. Be this as it may, it seems certain that the present trout now flourishing in the Aberdare streams are descended mainly from Leven trout, crossed probably with the Rainbow trout. There seems to be no pure Rainbow trout; probably, long ere this, they would, following their usual habits, have perished in the attempt to get out to sea, after eating up everything they could find on the way. There is of course just the possibility of their having reached the sea by way of the Tana River, though then it would probably be only to perish in tropical waters. A more promising trout than the Californian Rainbow seems to be the Californian Yellow-finned trout. The Algerian and South Italian trouts should also be tried.

But to come back to British East Africa and the Aberdare streams:—

In 1908 Mr. Macgregor Ross and myself, on our way to Kenia, passed the Gùra River, and though I halted there for some time, I could see no fish: but a year later, a good-sized fish was caught by an official of the Forest Department, and

sent to Mr. Jackson (then Lieut.-Governor) as evidence that trout had established themselves in the Aberdare forest streams.

Shortly after returning from leave, I resumed the project of introducing the German domestic carp to the waters of Lake Naivàsha (of this more anon), but in the discussion which arose it was pointed out that carp in Lake Naivàsha might have a prejudicial effect on the propagation of trout there. Carp are not cannibals like trout, but they love to browse, like sheep, along the bottoms of still rivers and ponds and feed on the ova of other fish. Mr. Clarke (of the Longonot Syndicate) and others who are conversant with the present position of trout in the New Zealand lakes were unanimous that if carp were placed in Lake Naivàsha trout would not do so well as if placed there by themselves.

Mr. Clarke wrote: 'My experience in New Zealand is that where carp are turned out, trout do not thrive or increase at all. For instance, in Lake Rotomahana carp were very plentiful. There are numerous good streams running into this lake which were afterwards stocked with trout, both ova and spawn, but they never did any good; whereas, in all the lakes and streams surrounding Rotomahana where no carp were liberated, trout abound. I think the Mòrendàt a perfect trout stream and feel sure that in the waters of Naivàsha lake trout will thrive splendidly.'

Mr. Clarke lives on the borders of Lake Naivàsha and sails its waters about once a week, so that he is in a position to judge of its trout-bearing capabilities.

It has been decided, therefore, for the present, to exclude from the Naivàsha lake both the carp from Cape Colony and the bass which have been kindly promised by Mr. Roosevelt. In place of putting carp and bass into the Naivàsha lake, it was decided to try to get trout there; and the first step to take, with this end in view, was to get trout transferred from the Gùra river on the Aberdare moorland to the upper waters of the Mòrendàt, whence it is hoped they may spread naturally into Lake Naivàsha.

On June 8 last instructions were sent to the Forest Officer at Nyeri to proceed with the systematic transfer of the trout, if they were sufficiently abundant in the Gùra river, to other

streams on the Aberdare mountains, especially the Mòrendàt. On the 28th of that month, Mr. Guy Baker, Forest Verderer, wrote: 'There are a quantity of small trout now in the upper waters of the Gùra river, where they were originally hatched. They run over 1 lb. in weight. I have seen no young fish in the lower stream. I have not fished farther down stream than the bamboo and I have never seen Rainbow, they have probably gone further down still. The Gùra stream had previously only been fished by me twice when I happened to cross it on the way to Naivàsha. In September 1909 I noticed the trout were spawning.'

By the end of August Mr. Guy Baker had attained definite results, and moved some twenty trout to the Mòrendàt river. He had found the upper waters of the Gùra river well stocked with trout. But he also found that a few of the larger ones were eating many of the smaller ones. The fish were caught with a hook and transferred, with little loss, to canvas buckets, in which, taking precautions to keep the water cool, they were distributed to other rivers on the Aberdare mountains. By the end of August twenty-nine fish (varying in size from four to fourteen inches) were turned into the Mòrendàt. The average size of these twenty-nine fish was about nine inches. These were all selected fish; the very large ones and some that were injured in the catching were turned back into the Gùra river. They were all caught with a hook and bait, usually a worm. It was remarked that they appeared to be of different species: though most of them seemed to be the ordinary brown trout, some were very light in colour with thickly placed black spots on the back, and with red spots much the same as in the ordinary brown trout. One, Mr. Baker remarked, resembled no trout he had ever seen. It had no red markings and was thickly covered with large black spots. Its fins were a little larger than those of the brown trout, particularly the fin just over the tail. He noted that the fish spawn towards the same time of the year as in England, but irregularly; one may be ripe now, the next not for two months. Their food consists chiefly of crabs. In the early days of fish culture here it was the crabs that ate the ova: the trout have now turned the tables on the crabs! Mr. Baker added there are a number of large

fish in the streams which should be removed. It is possible now to get 10 or 12 lbs. of fish any day one cares to do so !

I suspected that, as has happened in other places, the larger trout were eating the smaller ones. Early in October Mr. Baker obtained evidence of this. While moving the fish, he found that they could not travel long in buckets without getting exhausted for want of aerated water, and so made small dams in which they were placed temporarily. Dams were also used for storing fish caught before proceeding to carry them a distance. In one of these dams, two large trout of about 3 lbs. each, together with 27 small ones, were placed. In three days the two large trout had eaten 13 of the smaller ones, and when taken from the dam a fish 9 inches long was pulled out of the mouth of one of the large ones !!

Altogether, 29 trout were placed in the Mòrendàt, and 35 in the Chània river.

The largest trout caught by Mr. Baker weighed $6\frac{1}{2}$ lbs. and was two feet long: see the photo attached.

Towards the end of November and early in December an attempt was made to hasten the work of transference by spawning some of the fish in the unstocked rivers. Three trout were spawned and the spawn of two fertilized; but the care of trout spawn requires many precautions and technical knowledge, and it is doubtful whether this part of the work has had any results. For next season, arrangements have been made for having one or two Foresters, now on leave in England, trained practically in fish culture, so that, in 1911, between September and November, the distribution of the fish among the Aberdare streams may be undertaken on a larger scale. In the meantime, we have now the assurance that a sufficient stock has been placed in the Mòrendàt to start the stocking of that stream, and eventually Lake Naivàsha, while in the Chània and other streams on the Aberdare, trout are now in a fair way to multiply and become established.

Proposals are under discussion for getting out a fish-culture expert, more especially for the work of placing trout in the numerous streams and rivers on the Mau (and west of it) which flow into Lake Victoria Nyanza. Also for getting

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a consignment of eyed ova from the Government trout hatchery at Jonker's Hoek near Cape Town.

Mr. Woosnam, the Chief Game Ranger, has recently returned from the Aberdare forest, and speaks enthusiastically of the fine appearance and development of the trout. He caught a few readily with a fly and returned them to the Gura river. The fish are larger than they would be at the same age in England, but similar to those that I remember of like age in South Africa. But he adds that the increase has not been as much as it should have been, and puts down this comparatively slow increase to the liability of deposits from the water, this being particularly detrimental to trout eggs. He remarked also that the spawning season was irregular, there being at the same time fish that have been spawned for some time and others that are far from ready yet to spawn.

THE INTRODUCTION OF THE DOMESTIC CARP TO BRITISH EAST AFRICA

On the 9th of October last, forty-two carp fry arrived from Cape Town, and the greater portion of these fish are now flourishing in the dam at the Chief Conservator's house, Nairobi. The history of the introduction of these interesting fish is as follows :—

In 1908 the late Lieutenant-Governor, Mr. Jackson, in the course of a tour round Lake Naivasha, made tests to ascertain the truth of the assertion that, in this comparatively large lake, there were no fish of any size. His tests proved the truth of the assertion that there were no fish worthy of the name.

I had long cultivated carp in Cape Colony. Details regarding the successful cultivation of carp there will be found in an article entitled 'More about Carp,' published in the *Cape Agricultural Journal* for August 1906. This article contains a full-page illustration of one of the carp bred at Strubenheim, Rosebank, near Capetown, which at two years of age weighed $1\frac{3}{4}$ lb. It was caught with a rod and took the fly readily. After Mr. Jackson's tour round Lake Naivasha in 1908 it was determined to attempt to introduce the Prussian mirror carp from the Cape. A small sum was raised by

public subscription, and on my writing to Mr. McLean, the manager, at Cape Town, of the Union Castle Company, he promised to send up the fish to Mombasa free. On my return from leave, at the end of 1909, I took the matter up; and after some delay, owing to various causes, a carboy containing forty-five little carp, about half an inch long, arrived safely at Mombasa. Then ensued a most untoward accident. While the fish were being brought up from Kilindini to Mombasa, the carboy rolled off the waggon and was smashed to pieces. But carp are handy fish, and thanks to the trouble taken by the Transport Department to meet this disaster, the fish were picked out of the broken carboy, and put into fresh water and arrived at Nairobi with the loss of only three fish. I was away in German East Africa when they arrived, and it was not known that there were carnivorous native fish in the dam at the same time. However I got the dam pumped out on my return, and the little carp fry separated from the native fish. When this was done, we found that the number of carp had been reduced to thirty-three. These were viewed by Mr. Jackson, the Lieutenant-Governor, and about the middle of last December were returned to the dam, where they are now thriving and increasing rapidly in size. Two fish, which recently came to the surface, killed by some unknown cause, were found to have grown five inches in length in four months. They were in the pink of condition and looked perfectly healthy. Dr. Ross has examined these fish and determined the cause of death as inflammation of the intestines. It has been probably caused by the dirty state of the water in the dam, owing to the cutting of the supply furrow from the Nairobi River. Steps were at once taken to remedy this.

As mentioned above, it has been decided not to introduce carp into Lake Naivasha until it has been proved that trout will not thrive there. Carp is to be restricted to the lower and more sluggish waters of the rivers and to such dams and ponds of still water as may be fit for them; together with certain of the lakes which seem unsuited to trout. I may mention the dam of the Electric Light Works near Nairobi, the shallow Lake Naivasha on the road between Londiani and Ravine, also the water impounded above the dams of the Nairobi river at

the old pipe intake, and below Mr. Grogan's house, Chiromo. When carp become abundant, it is intended to try their acclimatisation in the brackish waters of Lake Nakuru, Lake Elmenteita, Olbollosot, and various other lakes. Carp have become acclimatized in the Caspian, and it is hoped that they may become acclimatized in the brackish waters of East Africa, where it would be hopeless to attempt the cultivation of the salmonidæ. No doubt carp have a wide field of usefulness before them in the dams and brackish lakes and river pools of British East Africa where trout will not thrive. They will live long in dirty, sluggish water. They will even survive for a time when the water is gone, provided they can burrow in damp sand. They will take any sort of food. Says Sir Herbert Maxwell in his recently published charming work on British Freshwater Fishes: 'Carp dislike strong water, and although they thrive in the Thames and many other rivers, it is only the sluggish parts of them that they frequent, and they may be considered as sharing with the tench the attribute of being a distinctively pond fish. In their diet they may be termed omnivorous, browsing freely upon grass and water-weeds, but far from disdaining worms, larvæ, and small fish of other species.'

One of the chief uses of carp near houses in warm countries is their habit of eating up mosquito larvæ, and thus acting as mosquito traps. During the day, at my house at Nairobi little is seen of the carp. But at evening, when the mosquitos and gnats come out to skim on the water, the carp may be seen taking their evening meal, coming up with a rush and that peculiar smack-of-the-lip sound, which characterises the feeding of these fish. At my house, during the past warm weather and mosquito season, there have been fewer mosquitos than at most houses in Nairobi in spite of a good deal of vegetation which naturally harbours them. Some years ago in Paris, during an epidemic of mosquitos, it was decided, after a scientific inquiry, that householders had to do one of two things: (1) maintain fish in their ponds, or (2) keep their cisterns and ponds coated with a layer of paraffin.

My experience has been that carp want little or no artificial feeding, and they thrive best in moderately deep water through which there flows a gentle current. They will thrive in stagnant

water which has remained dirty and unchanged for months ; but, under these conditions, they do not grow so rapidly, and if the dirty water be too prolonged, they are liable to the attacks of a disease called *peste rouge* in France.

The cultivated carp of Germany is, of course, an excellent eating fish. Attached to all the old monasteries were the carp ponds, or stews, for Friday's dinner, and for the banquets of the more luxurious nobles who, at that time, were unable to get supplies of fish from the sea. A German carp that has been properly fattened and well cooked has an entirely different flavour from the little, muddy-tasting, degenerate carp of British waters. Carp thrive best in a somewhat warmer summer climate than England ; and before being eaten should be put in a small fattening pond and fattened, like a pig, on meal. In the old days, very great care was taken in the breeding and fattening of fish, castration even being practised to hasten the fattening process. Those who care to cultivate the fish on a large scale should read the particularly interesting French work which has lately appeared on this subject—' *Pisciculture*,' by G. Guenaux (Baillière : Paris).

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NOTES ON SOME OF THE PRINCIPAL BITING FLIES IN BRITISH EAST AFRICA

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Before discussing the methods of collecting biting flies it will be as well to give a short synopsis of the genera most likely to be met with by the ordinary resident or traveller in this Protectorate.

The great majority of bloodsucking flies in Tropical Africa belong to the family *Tabanidae*, of which the principal genera are *Tabanus*, *Haematopota*, *Pangonia*, and *Chrysops*.

Most of the species belong to these four genera, and to simplify matters I do not propose to go into details concerning